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TÍTULO IMPLEMENTATION OF IEC STANDARD X-RAY BEAM CHARACTERIZATION USING ION CHAMBERS AND A SILICON PHOTODIODE

TITLE IMPLEMENTATION OF IEC STANDARD X-RAY BEAM CHARACTERIZATION USING ION CHAMBERS AND A SILICON PHOTODIODE

Autor: Denise Yanikian , R. A. Terini, T. A. C. Furquim, P. R. Costa, S. B. Herdade

Resumo: Introduction The International Electrotechnical Commission (IEC) publication 1267 (1994) defines a series of radiation conditions which must be evaluated when attenuation properties of diagnostic X-ray equipments or devices are investigated. The IEC 1267 simplified procedure to define x-ray beam half value layers (HVL) was compared to spectral evaluations combined to an empirical model for photon attenuation.

Materials and Methods Each tungsten target radiation condition defined in IEC 1267 was obtained following the test procedure described in this standard. An X-ray assembly from the Medical Diagnostic X-ray Laboratory of the IEE/USP was used to achieve the required IEC conditions. Electric parameters were controlled by a Dynalyzer III HV divider. Radiation measurements to obtain the additional filtration required to match IEC prescribed HVL values were performed by using a 10x5-6 Radcal ion chamber coupled to a 9015 Radcal monitor. A Siemens SFH206k silicon photodiode was used to registrate spectra from these defined radiation beams. The raw data have been corrected by using a stripping procedure which includes the correction for the detector full energy efficiency. By comparison, theoretical spectra was generated from TBC model (Med. Phy. 18(2), 1991). Attenuation curves were extracted from these measured and theoretical X-ray spectra in order to calculate HVL's values which should reproduce the IEC required ones. This calculation was based on a modified formulation of the Archer model (Med. Phy. 21(9), 1994) for fitting a parametrical equation to experimental attenuation data of polyenergetic radiation beams. Both required IEC and spectrally extracted HVL values were compared to evaluate the sensitivity of the proposed IEC methodology.

Results The IEE/USP X-ray beam generator has been conditioned, for example, to satisfy